method, and conclusions are arrived at which will be sure to provoke discussion. Whatever may be the final results of such discussions, this book will probably take rank as a landmark in the study of ethnology. A. C. Haddon.

TYPHUS FEVER.

Typhus fever, which has just appeared in some of the prisoners' camps in Germany and is rife in Serbia, has been one of the great epidemic diseases of the world. Hirsch remarked:—"The history of typhus is written in those dark pages of the world's story which tell of the grievous visitations of mankind by war, famine, and misery of every kind."

The name is of no great antiquity, for it was applied to a malady or group of maladies first by Sauvages in 1759. Until then, from the time of Hippocrates downwards, it had been employed to designate a confused state of intellect, with a tendency to stupor. It was, in fact, not until 1850 that typhus fever was finally differentiated from typhoid or enteric fever by the researches of Jenner. One of the older synonyms for the disease was *jail fever*, and in the sixteenth century, at the first three of the famous "Black Assizes," judges, sheriffs, and jurymen were stricken with it as the result of infection from prisoners brought for trial. Another name formerly given to it is *Morbus castrensis* or "military fever," on account of the ravages occasioned by it among soldiers and camp followers from the time of the Thirty Years' War and the English Civil War down to the siege of Sebastopol. Owing to the character of the eruption, typhus fever has sometimes been termed "spotted fever" (to be distinguished from cerebro-spinal fever, also known as spotted fever), and the German name is *flecktyphus,* also *typhus exanthematicus,* to distinguish it from *typhus abdominalis*, typhoid or enteric fever. The French name is similarly *typhus exanthématique*. Brill's disease, met with in New York, and Tabadillo of Mexico, seem to be manifestations of it. Few countries have suffered more than Ireland, and the disease has lingered in the outer Hebrides, but of late years has been practically unknown in England, and is seen but rarely in Scotland.

The invasion of typhus is, in the majority of cases, like pneumonia, sudden and severe after an incubation period of about twelve days. On the fourth or fifth day the eruption appears, first measly in character, but appearing on the wrists, trunk, and thighs, and afterwards becoming hæmorrhagic. The patient then suffers from severe fever with its usual concomitants, passing into extreme prostration. The nervous system suffers severely, and there is great muscular restlessness and tremor, excitement and delirium. In favourable cases the attack ends comparatively suddenly about the fourteenth day.

There are, of course, considerable variations in the course of the disease in individual cases; it is always to be regarded as a serious affection, and the average death-rate for all ages under favourable conditions is 15–19 per cent.; no age is exempt. An attack of typhus affords marked protection, and second attacks are as rare as those of small-pox. No special treatment for it has yet been discovered.

The ætiology of the disease is still uncertain: no specific micro-organism has been discovered, but it is probably protozoan in nature.

Typhus is markedly infectious, and the infectivity is greater the larger the number of cases which are aggregated together. The mode of spread for a long time was uncertain, and until recently it was regarded as being conveyed by the emanations from the patient. A few years ago, in the epidemic which occurred in Aberdeen, Prof. Matthew Hay made the pregnant suggestion, on epidemiological grounds, that the disease might be conveyed by fleas. Further investigations have conclusively proved that it is conveyed by the body-louse, possibly by the head-louse also. This important fact explains how it is that typhus is so prone to appear in times of stress, war, and famine—when misery prevails and personal cleanliness is difficult or impossible to maintain.

Prevention of the spread of the disease largely resolves itself, therefore, into extermination of lice, and much attention is now being directed to the means which may attain this end. R. T. H.

AN ADVISORY COUNCIL ON INDUSTRIAL RESEARCH.

The proposed formation of an Advisory Council concerned with industrial and scientific research was announced by Mr. J. A. Pease, President of the Board of Education, to the deputation of which we gave an account last week. The scheme was described by Mr. Pease in Committee of the House of Commons on May 13 in connection with the Education Estimates; and the debate which followed upon it was one of the most important from a scientific point of view that has been heard in the House for a long time.

The general question of the relation of science to the State, and the particular work which a suitably constituted Advisory Council could undertake, are dealt with elsewhere in this issue of Nature by Sir William Ramsay. We need scarcely remind our readers that the need for increased provision for research in pure and applied science has been urged in these columns for many years by leaders in the scientific world concerned not only with the advancement of natural knowledge, but also with the promotion of national prosperity. For the past ten years the British Science Guild has been continuously endeavouring, with little encouragement, to secure public and official recognition of scientific research and organisation as essential factors of industrial progress. It has shown over and over again that whereas in Germany the State fosters all work and institutions engaged in scientific work and advanced technology, and in the United States private benefactions increase the endowments for such purposes at the rate of about 5,000,000*l.* annually, in the United Kingdom neither the State nor the generosity of individuals makes provision for research on a scale at all comparable with what is done in the two countries which are our chief competitors in the industrial world.

The war has brought to the forefront the national necessities to which Sir Norman Lockyer directed attention in his presidential address to the British Association at Southport in 1903, and throughout its existence the British Science Guild has persistently endeavoured to stimulate action which would encourage the expansion, and promote the use, of the scientific forces of the Empire. At last both men of science and members of Parliament have awakened to a sense of the importance of these matters; and, as we reported last week, representatives of the Royal Society and the Chemical Society have urged upon the Government the need for intimate interest by the State in scientific research and its relation to manufactures. We congratulate these and other societies upon the support thus given to the efforts of the British Science Guild to organise scientific work in the interests of national welfare.

Political leaders have expressed, from time to time, their sympathetic interest in scientific investigation and their belief in its influence upon industrial development, but until now little attempt has been made to give practical value to their profession. The unanimity with which the scheme put forward by Mr. Pease was supported in the House of Commons shows that all parties are prepared to make adequate provision for scientific work and its organisation in the interests of industry when a definite policy is proposed. We reprint below, from the official report of the debate on May 13 (Parliamentary Debates, vol. lxxi., No. 52) the main parts of speeches referring to the Advisory Council.

MR. PEASE: The war has brought home to us and to our notice that we have been far too dependent for very many processes and many materials upon the foreigner, and we have realised that it is essential, if we are going to maintain our position in the world, to make better use of our scientifically trained workers, that we must increase the number of those workers, and that we must endeavour to secure that industry is closely associated with our scientific workers, and promote a proper system of encouragement of research workers, especially in our universities. The fault in the past, no doubt, has been partly due to the remissness on the part of the Government in failing to create careers for scientific men. It has also, I think, been due partly to the universities, who have not realised how important it is that pure science ought to be utilised with applied science and brought into close contact with manufacturing interests. I think it was also partly due to the fact that the manufacturers themselves under-valued the importance of science in connection with their particular industries. It was partly due, too, to the fact that the ratepayers have been too niggardly in making provision in connection with their technical institutions and colleges.

I ought, perhaps, to give a few illustrations to the House in order to show that by expenditure in the first instance of a comparatively small sum of money, which ought to develop into very substantial sums of money in the future, much can be done by research workers, and by properly scientifically trained individuals in regard to many of those processes for which hitherto we have been dependent upon other countries. We relied upon Germany for hard porcelain tubes used in pyrometers which are required for measuring high temperature. On a supply of these pyrometers depends the manufacture of needles required for the sewing of boots and providing the footgear of our troops. I am glad to say that, owing to the research work that has taken place recently, we are now able to produce as good porcelain as that previously produced for this purpose in Germany, and we are able, therefore, to produce the necessary needles for this purpose. It may astonish the House when I tell them that, whereas four firms in Germany employ 1000 chemists in connection with their dye works, in the whole of our industries there are only 1500 chemists employed. There are in Germany more than 3000 students, even at the present time, so far as I can learn, studying research work in connection with their university life, whilst in this country I do not think we have more than 350 students engaged in such research work. Let me give another illustration of the success which may be secured by research work. Our successes over our enemy in aviation are very largely due to the investigations made into automatic stability by a young man who went through an elementary school, fought his way up to the Imperial College, and went through a course at the National Physical Laboratory, and invented and introduced the B.E. biplane—at any rate, from his investigations the B.E. biplane was developed. We have hitherto done very little to encourage these brilliant young men taking up a scientific career.

The average salary given to a junior teacher of science is, I am told, only about 150*l.* a year. With a meagre salary of that kind it is not to be expected that individuals are going to endeavour to enter a career which is so badly rewarded. Let me give the Committee just one other illustration of what research may do. Lyddite was made at the commencement of the war out of phenol. The price went up at once from 6*d.* to 5*s.*, and owing to laboratory experiments conducted by Prof. Green at Leeds he was able to reduce the cost to 1*s.*, as lyddite can now be made from benzol. That was entirely attributable to the research work of one man. If those things can successfully be done in times of war, I know how many things can be done in times of peace. I have been associated myself with the production of a large number of by-products from coal, and it was even necessary to go to Germany for the bricks and plant in order to erect a certain oven in this country. I satisfied myself that it is possible that these materials can be produced, and ought to be produced, at home, if only we had a sufficient number of research workers and trained men of science turning to practical value their scientific training.

I could go on and develop this subject. I see opposite a representative from Ireland who asked me a question in regard to technical optics, and there is a great deal of work to be done in this country with reference to that subject. A professor told me the other day that it had only just been found out why they were making so many failures. A greenish hue came into the glass they were producing, and in consequence they were unable to produce the necessary lenses. By research work it was found that this was due to barium oxide being contaminated with iron, and they had to go to another source in order to obtain the glass free from this impurity. And so I might go on and give case after case where by research and a little expenditure on the scientific training of able men we would be able as a country to succeed just in the same way as the Germans have succeeded in recent years. My fear is that after the war we shall have to contend with a fiercer competition than we have had to contend with even in recent years, and it will be conducted by our enemy with less scrupulous methods. The Government agree with me that something ought to be done at once, and we must make more use of the workers in our country and prepare for an increased supply of them, and bring our universities and technical institutions into closer association with industry, and also bring our leaders of industry into closer association with skilled workers. Steps must be taken at once. Adequate supplies require prolonged endeavour. The task immediately before us may be advanced at once by the appointment of an Advisory Council on Industrial Research. I want a Committee of experts who will themselves be able to consult other expert committees working in different directions. They, in turn, must be associated with leaders of industry. We shall want advisers representing various industries in the country who not only possess certain knowledge in connection with pure science, but will be able to turn to the best account the knowledge they have acquired in the application of that knowledge to industry. We shall work in close co-operation with the Board of Trade, who are seconding the efforts of my old board. Such a body as an Advisory Council of very distinguished men upon whom we shall rely for advice, ought to be at work, and I hope it will be at work within the next few weeks. I am now considering the names, although I am not in a position to name them at the moment.

So soon as we get a Committee of that kind nominated they will at once begin their work. The solution of several problems will be placed before them in connection with the glass industry, the making of hard porcelain, technical optics; and it will be one of their duties to secure selected workers who have passed through graduated courses suitable for doing research work in laboratories in the solution of a certain number of definite problems. They will have to advise me as to how money should be immediately spent, and how it should be subsequently spent when we are able to obtain rather larger grants from the Treasury than we shall have at our disposal during the current year. They will have to advise as to the way money should be spent in training and research work generally, and how money should be spent and distributed amongst specialised departments, such as the Imperial College of Science at South Kensington. What I am anxious to secure is the use of the best scientific brains in connection with this enormous problem which is of such vital importance to the country. I hope to place on the Estimates for the current year a sum between 25,000*l.* and 30,000*l.*, but the demand for money for this work will enormously increase as time goes on, and I want to inform the House that whilst we are beginning with this comparatively small sum we think it will develop, and if the scheme is to succeed I believe it must depend upon State help in the years to come, and State help must steadily progress.

As I have been longer in my present post than any of my predecessors, I may be allowed to say that in my judgment two things are essential in the interests of this country if we are to maintain our position and succeed in the future and remain in the proud position, industrially and commercially, in which we are now situated. First, that after the war, and even during the war, an effort should be made to retain longer at school those who are able to benefit by further education. Too many now leave school at the ages of twelve, thirteen, and fourteen, and there is an enormous wastage of ability in the country owing to the non-education of the children after that age. Secondly, the nation should create careers for men who are capable in the scientific world of benefiting that problem. If we had these two things I believe we should maintain our position, and without them I am afraid we shall be discouraged. Therefore, so far as I am able, I wish to appeal to all those men throughout the country who are devoting their lives to the cause of education to do what they can to encourage, not only the longer education of abler children in the secondary schools, but also to make the scheme which I have outlined here this evening very briefly a success in connection with training scientific workers who will be a real advantage to the industries of this country in years to come.

SIR PHILIP MAGNUS: I have no doubt whatever that the scheme for co-ordinating more successfully the science of industry will be welcomed by all scientific men in this country. I should not like it to be thought for one moment that our universities and our technical institutions have failed to turn out a sufficient number of scientifically trained men to be able to carry on research work in connection with our industries almost to the same extent that it has been done in other countries. Where we have to some extent, and to a large extent, failed in this country is in the appreciation of manufacturers and employers of the value and importance of such scientific training, and if the conclusions at which the President has arrived, and if the facts connected with this war will bring home to our manufacturers and employers the great advantage which they can obtain by liberally supporting scientific men in connection with their work, then the Right Hon. gentleman will not have spoken in vain this evening.

There is nothing in which we have been more deficient in this country than in scientific organisation, and, if I may say so, in the organisation of our science, and to this I hope that any such council as he has proposed will diligently apply itself. We have a great number of institutions doing excellent work, but the work of one often overlaps that of another. We want very carefully to see that each institution does that work which it is best fitted to do, and that manufacturers shall have no difficulty whatever in obtaining through any technical or scientific institution the particular class of scientific man which will be helpful in the industry in which they are employed. Take London, for instance. We have already the Imperial College of Science and Technology, on the organisation committee of which I was a member. We have also the Imperial Institute, in which a certain amount of research work is being done of a very high quality in connection with our colleges. We have also, not very far removed, the National Physical Laboratory, where research work is being done, but where more research work might be done if larger funds were available for the purpose. In Berlin there is what is called the Reichsanstalt. That is a research institute which combines the work of our national institute and the National Physical Laboratory, and that institute is placed in close juxtaposition with its Imperial Institute of Science and Technology, which goes by the name of Charlottenburg.

The President of the Board of Education has referred to the fact that it is very difficult to obtain men who will be attracted to the profession of technologists at a salary of 150*l.* a year. I was sorry that he did not remember that the Government itself has advertised for very highly skilled technical chemists at Woolwich at that same salary. I complained of that years ago, but I was told that there was quite a sufficient number of highly skilled chemists only too glad to accept the position at that small sum. I hope that the Government will be the first to take to heart the lesson which the Right Hon. gentleman has given. There is only one other word I want to say at the present time. I heard with great satisfaction that it is proposed in the scheme to which the President referred that the Board of Trade shall be associated with the Board of Education. I attach great importance to that, because we do not want in this work merely theoretical scientific men. We want men who are imbued with the commercial spirit, and it is desirable that in any body who are to direct instruction by giving suggestions you should combine those who have an intimate knowledge of the trade requirements with those who at the same time are developing the scientific instruction itself. Personally, in the thirty-five years during which I have been associated in, it may be, a feeble endeavour to bring science to some extent to bear upon industry, I have always been most careful to see that the commercial requirements of those engaged in the trade are carefully considered by those who have the task of organising the schemes of instruction. I am glad to see that same policy is likely to be carried out by the President of the Board of Education acting in conjunction with the President of the Board of Trade.

Sir James Yoxall: I think that the Right Hon. gentleman even to-night attached more importance to the highly technical education which has been procurable in Germany under the German system of education than was just. The impression I have been able to form after years of study has been that it is probable that during the last twenty or twenty-five years as many capable men of science, highly skilled chemists and physicists, have been produced by the educational system of this country as has been produced in Germany. My impression is that probably in number, and certainly in quality, even our somewhat unorganised and uncoordinated British system has produced quite sufficient men to provide the industries of this country with sufficient guides, leaders, and captains. The fault has been not with them, or with the schools, colleges, and universities, but, no doubt, with the manufacturers and employers of this country, who have been blind to the opportunities which this material has presented to their hands. Even now, when my Right Hon. friend has created his excellent Advisory Committee, and has used his new grant and has developed further this admirable attempt on the part of the Government to provide for what may happen with regard to industry after the war, little will be the result so long as it is rooted in the minds of employers and capitalists that rule of thumb is better than rule of brain. I would suggest to my Right Hon. friend that he might consider, as a development of what he has submitted to-night, the running of this great concern which he has in view on a commercial basis, so that if manufacturers and capitalists will not take up this work, the State itself should take it up, and provide and sell to the manufacturers the results of researches which otherwise they would not obtain.

Mr. Anderson: Perhaps the most important matter raised by the President to-night was that of establishing an Advisory Council to deal with matters relating to science and industry, and to bring science into closer touch with industry. That is a very important statement. Personally, I believe that it is along these progressive lines, and not by adopting reactionary policies, that the nation is going to hold its own in regard to industry and trade. We have not in the past spent anything like the amount of money we should have spent in regard to scientific research and technical training. We ought to equip ourselves to the fullest extent along these lines, and it is by doing so rather than by adopting backward policies that we are going to make headway in the future. You ought to try to bring science and industry into closer touch with each other and to make science the great servant of industry, to make it a more practical matter rather than merely be taken up with abstract questions, and you ought to avail yourselves to the fullest extent of the practical knowledge and experience of the working people who are now employed in the factories, in the mills, in the workshops, and so on, and I believe in regard to that, that your Advisory Committee ought to have representatives of labour so as to show that you are going to bring the practical knowledge and experience of the workpeople into account in this matter, and I believe it will be important from the point of view of the success and welfare of your scheme.

Mr. Lynch: Whatever we think of the material aspects of Germany, we really have in her history one of the most extraordinary examples in the whole history of the world of a nation gradually rising to great material power on a foundation of high scientific education. The rise of Germany does not date, as some have said, merely from the great victories in 1870, but from a much earlier epoch when a German with a less salary than the then President of the Board of Education held that office for only two years, and yet within those two years left such a stamp on the education of Germany that it has remained ever since, and has been the real source of the education of the nation—Wilhelm von Humboldt.

Let us consider now one of the questions referred to by the President of the Board of Education to-night, technical education. When we speak of technical education in this country we are too apt to think of trifling details, such as wood carving and filigree work, or such as crewel-work or crocheting impossible parrots on the background of some fancy cloth. In Germany technical education has a very different and a much higher meaning, and having had the advantage of studying in the University of Berlin myself, I can say that one of the most abiding impressions of my whole life was the extraordinary revelation I had there, not merely of the devotion to science itself, but of the manner in which that widened out the whole horizon and prospect of the nation's view, and the way in which science was seen to be the vital influence in great enterprises and wonderful industries. I would not labour this question to-night, but those who have leisure might refer to an article by Sir William Ramsay, first published in Nature in November, 1914, but to which my attention was called in the French paper *La Revue Scientifique*. The French recognise the value of that article, and in France I think it got wider publicity than in this country. Sir William Ramsay analyses the causes of the greatness of Germany in the industrial world, and he finds several very interesting points which he tabulates. The first is that in a great German industry the board of directors are not a set of ornamental magnates with a peer thrown in to give respectability or publicity, but are a board of specialists on that subject which is the basis of the industry, keen and hard-working men. Secondly, that there is another agency definitely appointed with the definite active functions to watch out for new inventions in other countries. I could enter into this question very deeply, and I could show that right throughout the range of industry there are cases where the real central idea of that industry has not originated in Germany, but in France, England, or America. I believe if I were to ask which is the nation most fertile in ideas and most inventive, from my own brief experience I would be inclined to place the French in inventive genius above even the Americans. The Germans are always looking out and asking the question, "In what way can we utilise new inventions for the benefit of our own industry?" That forms No. 2 of the points of Sir William Ramsay.

The third is that there is another agency always asking the question as to the cheaper production of the material, not in a passive way, but in an active way; in making inquiries and making voyages to other countries, examining what is done there and exploiting the brains of other men, often covering up the source. That is what the Germans call war. Then comes in the question of protection by the Government. There is a point where the Government could actively intervene to foster industry. Another point not less important is the protection of patents. In many cases Germans have gone so far as to steal the patent from other countries and protect themselves by patents from the other country recovering its ideas. Then there is the propaganda of the excellence of their own products, sending men throughout the world, speaking many languages, active missionaries of the active progress and greatness of Germany. I will cite several industries. The German spirit of organisation is so great that in the most unexpected fields it is exhibited. I remember one of the most prominent mathematicians, M. Picard, of the Institute, who said that though perhaps there had been great names in the history of French mathematics equal to those of the Germans, such as M. Poincaré, who I am proud to have called my friend, who recently died; yet the Germans had pushed their organisation so far that even in that field, so abstruse, they had perfected an organisation for that study.

Take the question of aniline dyes, of which we have heard so much, and which has been the subject of consideration in this House. It is always said in this House, and in the public prints and text-books, that the story of aniline dyes is that a British chemist, Dr. Perkin, discovered and invented a new dye, and that was stolen by the Germans. The matter does not rest in such a passive way at all. Perkin was not, I believe, the first man to produce coloured material from the by-products of coal tar. That was done by Runge some years before. In 1856 Perkin produced his first aniline dye, mauve, and that was considered a great achievement in this country. Already the Germans were beginning that extraordinary organisation of which they are the masters. They seized hold of this, saw its possibilities, and set to work in all the laboratories of that great kingdom, particularly Prussia, and soon produced a whole succession of aniline dyes. They opened up new possibilities, and in this way founded their industry in a perfectly legitimate manner. So that the lack in this country was first a want of appreciation of the value of that discovery, and then the want of active organisation to make use of the discovery when found.

Or take, again, the case of glass, also raised by the President of the Board of Education. The manufacture of glass, of course, has gone on from time immemorial. As a matter of fact, one of the oldest glass manufactories in the world was in what at that time was a Roman colony, Cologne. The most interesting development of the glass industry, however, was, perhaps, the manufacture of optical glass. It arose in this way: A German physicist of great ability, Abbe, noticed that a great deal of the finest microscopical work was robbed of its value by the difficulty of obtaining good optical glass, and so he turned directly away from his own study, sacrificed himself in a certain measure—that is to say, sacrificed his scientific ambitions—upon the altar of the industry of the Fatherland, and devoted his great talents to the study of glass in itself. Being a man of scientific endowment, he speedily discovered what those who had been engaged in the industry before without scientific knowledge might not have discovered in a hundred years in reference to the manufacture of glass. Then came another point which has been raised earlier in the debate. After having reached a certain point, he found that it would be difficult for him to proceed without being sustained financially. He then appealed to the State. The German State was intelligent enough to foster his researches in every possible way, to pay him not merely for his chemical research, but for his endeavour to build up a great industry. So there you have a striking example of the alliance of science with industry, and of State aid supporting both, one which we might very well take to heart. The result was the building up of an industry which imposed itself upon the whole world, and is one of the legitimate glories of Germany to-day. Every medical student who wishes to do his work well is forced to buy a German microscope.

Compare that with the condition of things in this country. I have come down to this House myself in those days when I was more hopeful and I had a real respect for the Government, and I have pleaded for 10,000*l.* for great research work, research work which would have enabled one of the very few men in this country who stand out in the eyes of the whole world as a great figure in modern science, to do most useful work, and I was received with a certain polite indifference and shunted off. I say that, so far from asking 10,000*l.* for research work, I should have been entitled to ask for 10,000,000*l.*—that is to say, if I could ask with sufficient authority—to stimulate in every possible direction the great industries of this country. I go so far as to say that eventually the whole civilisation of this world, and not merely of England itself, must turn on the axis of science, and as we advance we must give proportionately greater and greater importance to this great development of scientific life. When I was a student some years ago of some of these questions, of which I have only given one or two examples out of hundreds which I could expound to the House, I made this extraordinary discovery, that in tracing out the development of science I was really in my own mind proceeding with the development of Humboldt's cosmos. That is to say, that science is the roof of civilisation, and our civilisation is superior to that of the Greeks only in one particular, and that one particular is the advance in positive science. As a result of the advance of positive science our modern civilisation has reached that great expansion which we now recognise.

Then the President spoke about the number of chemists in this country, and said that the number of research students in chemistry is only 350, and yet this country is competing in the commercial world with Germany! I have looked into the organisation in Germany, and I find this astonishing fact: That, in the great chemical works in Germany, for every fifteen men employed in any category whatever there is one highly trained specialist and chemist, and that this industry is so important that there is one highly trained specialist in chemistry for every forty-five employés in any category, right throughout the whole range of industry. When we reach facts like these, are we astonished at the pacific invasion of Germany in every country in the world which, had they been sage enough, would in fifty years have given them a mastery of the world without the cruel and brutal and abominable war which has caused such suffering? But knowing the enormous disparity between one trained chemist for every forty-five employés in all industries, and a total of 350 research students in this country, how are these defects to be remedied? Partly by giving encouragement to students of science. That is important, but it is not all. I asked a question in this House about the pay of students of chemistry. I find that the War Office itself, which is advertising for students of chemistry, some of them men with degrees, all of them required to do analytical work of a really very difficult kind, such as, after a man obtains his degree in chemistry, would require some special training for at least six months to do the work with the requisite degree of fineness, offered to these men a salary of—1000*l.*? There would be nothing preposterous in that. Some of these men are quite qualified to become professors in the great capitals in the Dominions. Was it 500*l.*? It was 100*l.* With what conditions attached? Those men technically were placed on the same footing as ordinary workmen, and they could have been required, had the regulation been enforced, to join in a queue every Saturday to take their 2*l.* at the pay office.

To-day an advance has been notified by the Under-Secretary for War. They are paid 150*l.* Even that is scarcely enough to stimulate men to follow in the path of scientific research. I do not believe that any man who has the true scientific spirit—I appeal to my hon. friend to back me up there—is ever attracted by the mere sake of gain. There is something of the scientific spirit which is almost incompatible with making money. When I read the lives of the great workers of the past I feel indignation even now. Take, for instance, the record of Faraday. The great man, who stands out among the few whose names will be remembered for a thousand years, even after the records of our own Parliament have passed away, as one of the great pioneers of human civilisation; toiled all his life at the stipend of the valet of a peer, and that, remember, in a country where a man's social status and his work, as he calls it, is judged very largely from the amount of salary that he earns.

There will be a revolution when the war is over; a peaceful revolution, if you will, which will be felt right throughout the world, enlarging our education particularly in regard to our technical schools. We do not want the history of the world in text-books given to children at their most susceptible age, which divide history into reigns of kings and queens, most of them utterly worthless, as if the whole philosophy of the world turned on the sanguinary and wretched and often unintelligible accounts of wars and battles. I hope the time will come when we shall have a clearer and saner view of the whole scope and importance of education. It will be more important for the child to know the date at which Oersted discovered the reaction between electricity and magnetism than even to know the date of the battle of Waterloo. There is in science a real spiritual influence—that it to say, the most alluring and fascinating of all the problems which can attract the mind in the gradual unfolding of the meaning of this world itself in which we live. I would like the President of the Board of Education to take his courage in his hands as did Wilhelm von Humboldt in other days; and if he feels himself not strong enough to do this work solus, let him call in the aid of those enthusiastic in the development of science, and the help of those committees of which he has spoken, to carry out their recommendations, not in the half-hearted way in which matters have sometimes been presented in this House, but with something like the missionary zeal of a new evangel. I am certain that when this war is over if the education of this country remains in the condition in which it now is, you may bolster up your military power, you may build *Dreadnought* after *Dreadnought,* but this country will sink. But if this country is to save itself, to regenerate itself, and to proceed on a new path of high development, then the most vital of all problems is that of education.

Mr. King: On this Vote we have had a chorus of approval in favour of greatly increased expenditure on scientific education. I wish to join in that chorus. You cannot have a nation able to benefit by the scientific research and technical instruction and the various facilities for scientific advance which have been foreshadowed to-night unless you have a good foundation in elementary education. If you begin on the same night to cut and curtail elementary education, you are doing an evil turn to advanced research in scientific education. I wish very heartily to congratulate the representatives of the Board of Education upon having shown what is to my mind the first evidence we have had that statesmanlike foresight exists on the Treasury Bench at the present time. We have had plenty of energetic pushing on of the war, but in grasping the issues of what are to come after, and to prepare for the inevitable changes and difficulties and problems which will immediately arise at the end of the war, this is the first inkling we have had that those considerations are present to the mind of the Government. I congratulate the President of the Board of Education and the Parliamentary Secretary to the Board of Education on the scheme they have put forward. I from time to time directed attention, by means of questions and in other ways, to our great deficiency in scientific and technical education, especially with regard to research. Anybody who knows anything about Germany knows the enormous amount of money and the great numbers of men of the highest ability and training and standing engaged in purely scientific research and inquiry.

Everybody who thinks of it and who studies the question must know that Germany's position in the world to-day is due not to the real genius of the people so much as to organisation combined with education, and especially scientific education. I am very pleased that at this time there is an opportunity for an educational advance. I congratulate the members on the Treasury Bench upon their courage and persistence, for I believe it must have needed something of that kind to get this scheme through the Cabinet. I congratulate them on the prospect of having an early Supplementary Estimate. It is true it is only 25,000*l.* I think it ought to be ten times as much, but I have no doubt it is an estimate that will grow. I should like to recall to the members of the Committee the historical references, to my mind of great significance, which we had from the hon. member for West Clare (Mr. Lynch). It was in the year 1809, only two years after the Peace of Tilsit, that Prussia started the University of Berlin. Prussia had been robbed of half its territory by the Peace of Tilsit, which also imposed upon it an enormous indemnity. It had also to support a huge French army of occupation until the indemnity was paid. Yet in that very time Stein and Wilhelm von Humboldt founded the University of Berlin, which has become for its equipment and influence in scientific matters by far the greatest University in the world. They also established at the same time, when the taxes were simply overwhelmingly crushing, the elementary-school system of Prussia, which remains to the present day. I say that a nation that could so appreciate in its hour of ruin the value of education is a lesson to us which we ought to take to heart.

Mr. Rawlinson: I was very glad to hear the President's announcement of the creation of an Advisory Council to deal with this matter, and I need scarcely say that though I have not been able to consult them upon the point, the University of Cambridge, I am sure, will give most unstinted support to the scheme, such as it is. Whether it will be a success or not will depend upon matters which we cannot discuss to-night. It will depend largely upon the men and upon the methods by which the work is carried out. No one doubts that there is a need for it at the present time. The Right Hon. gentleman has enumerated some of the things in connection with which we have discovered the need, and he could have made a much longer list—things which are vitally important for the carrying on of the war. This country has had brought home to it the recklessness of any island country being dependent for its supplies to a large extent upon places outside its bounds. That is one of the lessons we shall learn from the war. It must be remembered that scientific men have been connected with agriculture and industry in this country before. They were connected with it in the best possible way; they were present while the work was being done. But in one case after the other the Germans bought up those firms and practically carried the industries away to Germany. We must not have that occur again. It is not merely a question of scientific research; it is much more a question of policy. So far as the scientific side is concerned, I think that even the President of the Board of Education was scarcely sufficiently optimistic when speaking of the enormous supply of men in the universities who are perfectly qualified and ready to take part in the industrial side of science. A large number are already doing so, and a very much larger number are perfectly ready and willing to take part and assist in the science of industries of any kind.

DR. ADDISON: There are many things which we must attend to without any delay, and it is for this reason that the Committee for Research will be set up quite soon. A great deal has been done by private effort in respect of research, and notwithstanding all that my hon. friend the Member for West Clare (Mr. Lynch) has pointed out, quite properly, in this connection, I think that the research which has been associated with British men of science has often been the most original of any in the whole world. We have not organised and developed it as we ought to have, but the British researcher is often freer in his outlook and greater in his conceptions, I think, than almost any other. At all events, he certainly stands far above the average German researcher, who tends more to apply the ideas which have been suggested by others, but from all that my hon. friend pointed out we have got to recognise that we cannot afford nowadays to leave all this to private effort. A great deal can be done by careful organisation and by seeing that the men turned out from our universities and technological institutions are equipped with that training which will make them acceptable in industry, and make them more likely to find a good market and a good career for themselves. Going around our institutions you will find certain departments where the professors will tell you that they cannot supply the men quickly enough to the manufacturers, while in other departments it is quite the reverse. The Royal Society has lately, very patriotically, been assisting chemical research in respect of drugs. This was one of the matters in which we felt ourselves behindhand at the beginning of the war. However, I think that my Right Hon. friend may be satisfied with the full assent of the House in all quarters in getting ahead with this great scheme, which, while we hear so much of the mobilisation of our industries with respect to the production of munitions of war, will quickly, for the first time in this country, show that we are going to some extent, at all events, to create a machine which will enable us to mobilise brains and science in the service of industry and national progress.

NOTES.

THE annual visitation of the Royal Observatory at Greenwich will be held on Saturday, June 5.

SIR WILLIAM CROOKES and Prof. R. Meldola have been elected honorary members of the Society of Public Analysts.

WE learn with regret of the death, on May 8, of Dr. P. Zeeman, since 1902 professor of geometry and theoretical mechanics in the University of Leyden.

PROFS. MAURICE CAULLERY (Paris), Charles Henri Marie Flahault (Montpellier), and Jacques Loeb (Chicago) have been elected foreign members of the Linnean Society.

THE London County Council has decided to commemorate the residence of Lord Lister in London by placing a memorial tablet on the house, 12 Park Crescent, Marylebone Road.

WE regret to announce the death on May 13, in his eighty-ninth year, of Dr. M. W. Crofton, F.R.S., formerly professor of mathematics at Queen's College, Galway, and also, later, professor of mathematics and mechanics at the Royal Military Academy, Woolwich.

SIR DAVID BRUCE will this year deliver the Croonian lectures at the Royal College of Physicians of London on June 17, 22, 24, and 29. His subject will be "Trypanosomes causing Disease in Man and Domestic Animals in Central Africa."

AT the annual meeting of the Iron and Steel Institute last week, the Bessemer gold medal of the institute for 1915 was, in the unavoidable absence of the French Ambassador, handed to M. de Fleuriau, councillor of the French Embassy, for transmission to M. Pierre Martin, for his invention of the open-hearth system of steel manufacture.

THE regents of the American College of Surgeons announce the appointment of Dr. J. G. Bowman as director of the college. The college was founded in 1913, and is an organisation of the surgeons of the United States and of Canada, having for its purpose the advancement of the art and science of surgery. The address of the executive offices is 30 North Michigan Avenue, Chicago.

THE trustees of Columbia University, in the city of New York, have awarded the Barnard gold medal to Prof. W. H. Bragg, Cavendish professor of physics in the University of Leeds, and his son, Mr. W. L. Bragg, fellow of Trinity College, Cambridge, and a member of the college staff, at present holding a commission in the Leicestershire R.H.A. (T.F.), for their work on X-rays and crystals. The medal is awarded every five years for "meritorious service to science," on the recommendation of the National Academy of Sciences of the United States. The previous recipients have been Lord Rayleigh and Sir William Ramsay, Prof. von Röntgen, Prof. Henri Becquerel, and Sir Ernest Rutherford.

A PARTIALLY restored skeleton of a small ancestral camel, *Stenomylus hitchcocki,* from the Lower Miocene of Nebraska, U.S.A., has just been added to the